





*of the author*

(10)

# CONTRIBUTIONS

TO THE STUDY OF SOME

## THORACIC DISEASES:

I. ON MITRAL REGURGITATION NOT ARISING FROM ORGANIC DISEASE.

II. CASE OF ANEURISM OF THE THORACIC AORTA.

III. CASE OF EMPYEMA, WITH INEQUALITY OF THE RADIAL PULSES.

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Reprinted from the Dublin Quarterly Journal of Medical Science, February and May, 1868.

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DUBLIN:

JOHN FALCONER, 53, UPPER SACKVILLE-STREET,

PRINTER TO HER MAJESTY'S STATIONERY OFFICE.

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1868.



ON

# MITRAL REGURGITATION

## NOT ARISING FROM ORGANIC DISEASE.

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THE possibility of the occurrence of regurgitation, through the mitral valve, independently of organic disease of any portion of the heart, is a question of great pathological and practical interest. The recognition of the characteristic murmur of mitral regurgitation is generally, and, no doubt, in the great majority of instances, rightly regarded as indicative of serious organic disease. There is reason to believe, however, that inorganic or functional murmurs are of more frequent occurrence than has been hitherto supposed. Functional disturbance of the heart, being usually a remediable affection, there is rarely an opportunity for examining the state of the valve, except in cases in which organic disease has existed. Various observers have, however, been struck by the apparently anomalous circumstance of the left auriculo-ventricular opening and its valve being found, on examination, to be perfectly healthy in cases in which murmur, apparently caused by valvular incompetence, had been heard during life. Such cases can be accounted for only by one of two explanations—either that a mitral murmur may be generated without regurgitation, or that derangement of the valvular function may be brought about by functional causes.

As far as regards the former of these two hypotheses, I have taken for granted that the existence of a systolic bellows-sound, possessing the usual characters of a mitral murmur in respect of situation, maximum intensity, and direction of transmission, necessarily involves regurgitation through the left auriculo-ventricular opening. This, which is the almost universal opinion among physicians who have paid special attention to cardiac diseases, is in

opposition to a statement of no less eminent an observer than the late Dr. Todd. Todd believed that a murmur might be engendered at the mitral valve in consequence of the deposition of lymph on its ventricular surface, the competence of the valve remaining quite unaffected, and, of course, no reflux taking place into the auricle; and even held that this condition of the valve could be distinguished from a condition producing incompetence by a special modification of the auscultatory signs.<sup>a</sup> This opinion of Todd has been regarded with little attention, and has not been adopted, as far as I am aware, by any considerable authority on cardiac disease. Indeed, although it is generally admitted that roughening of the endocardium in the neighbourhood of the arterial orifices may give rise to systolic murmur, it is impossible to conceive how a mitral murmur can be generated of sufficient intensity to be audible below the scapula, unless a current of blood flows through the imperfectly closed valve.

The second hypothesis will be discussed after the account of the subsequent case, which bears upon the question, and has some interest in connexion with it.

CASE I.—R. C., aged thirty-three, was admitted to the General Hospital on July 30th, 1867, suffering from dropsy. She was married, and the mother of three children.

She had been a healthy woman until four months ago, when she was suddenly frightened, she being then advanced in pregnancy; she did not miscarry, but from that time she began to suffer from palpitation, and soon after her confinement œdema of the lower limbs became evident. The heart symptoms and the dropsy had continued since, occasionally much relieved by treatment.

There was considerable anasarca and dyspnea, and she complained much of palpitation. The urine was not albuminous. A systolic bellows murmur was audible on placing the stethescope over the the heart, loudest at the left apex, and distinctly audible at the

<sup>a</sup> "If the bellows-sound be purely regurgitant, its position is strictly at the apex; it becomes in a marked way faint as you proceed to the base of the heart, and it is distinctly audible beneath the left scapula; and, in addition, the sign pointed out by Skoda, exists—namely, a marked intensification of the second sound. If the bellows-sound be not regurgitant, you hear it well up to the base of the heart; you hear it only feebly, or not at all, at the left scapula, and there is no intensification of the second sound. I may add that, in this latter case, the heart's disturbance, and the sufferings of the patient, are in a marked manner less than in the former."—Clinical Lectures by Dr. Todd, 2nd ed., p. 77.



inferior angle of the left scapula. Its intensity diminished as the stethoscope was removed from the left apex. The heart was very often examined by the clinical class, and no doubt was entertained as to the case being one of well-marked regurgitation through the mitral valve. There was no diastolic murmur nor any bruit in the large vessels. The jugulars were somewhat turgescient, but did not pulsate, and the intensification of the second sound, pointed out by Skoda, was not observed. There was nothing remarkable in the progress of the case. It was necessary occasionally to puncture the legs and thighs to relieve the dropsy. There was much pulmonary congestion, a good deal of severe dyspnea and distress, and she expectorated frequently small quantities of dark blood. The symptoms were ameliorated occasionally for a time, but no permanent improvement took place.

I learned that about three weeks before her admission she had been discharged from hospital after having been an inmate for nearly four weeks. She had been admitted under the care of Dr. Ross for symptoms of a similar kind to those under which she now laboured, but much less in degree. Dr. Ross also regarded her disease as incompetence of the mitral valve.

On October 1st she was transferred to the care of Dr. Drennan, who took charge of the ward in which she was, according to the system of rotation pursued in the Belfast Hospital, and she remained under his care until her death, on November 1st, 1867. It is to his kindness that I was enabled to obtain the examination after death.

The *post mortem* was made under circumstances of difficulty, and only the heart could be removed. It was examined carefully; the aorta and the pulmonary and tricuspid valves were found to be perfectly healthy; the mitral valve was well formed, and quite free from any evidence of disease, except a very slight thickening, about the size of a small shot near the free edge of its anterior flap. The circumference of the left auriculo-ventricular opening was found to be three inches and six lines; that of the right, three inches and eleven lines. The cavities seemed quite normal as regards capacity and shape, and the muscular structure of the heart was firm and well coloured. The carnae columnæ were well developed and firm, and nothing abnormal could be discovered in them or the chordæ tendineæ. I exhibited the heart, and read the notes of the case, at a meeting of the Ulster Medical Society, and it was carefully examined by several members of considerable experience in patho-

logy and anatomy who were present, and the unanimous opinion was, that there was no evidence of their being anything whatever abnormal in its condition. The heart was specially examined with reference to the suggestion which has been put forward by some observers<sup>a</sup>—namely, that atrophy of the muscoli papillares and smallness of the chordæ tendineæ may become important causes of valvular incompetence, but with an entirely negative result.

The appearance of the valve, as well as the symptoms and physical signs, presented a remarkable resemblance to Case I., published in the first of the admirable papers on “Diseases of the Heart,”<sup>b</sup> by Dr. M'Dowel. In Dr. M'Dowel's case, however, great dilatation of the left ventricle, and softening of its muscular tissue, existed, a condition which, as has been insisted on by Dr. Gairdner, may produce regurgitation through the auriculo-ventricular opening without the existence of any disease of the valve. No such change existed, however, in this case.

*Observations.*—It is of interest to observe that the first symptoms of ill health occurred subsequently to the patient having been frightened, the fright having taken place when she was in the pregnant state, a condition in which the nervous system is probably unusually susceptible of injurious influences of this kind. In chorea, a disease not unfrequently observed in pregnant women, mitral murmurs are occasionally observed, and these are attributed, with much probability,<sup>c</sup> to disordered innervation of the muscular apparatus connected with the valve. The idea naturally suggested itself that the valvular derangement might have been caused by the strong mental impression giving rise to spasmodic action of some of the papillary muscles. The influence of mental emotion in causing spasm of so partial an extent as that which produces strabismus is well known, and there is nothing inconsistent with our knowledge of the very limited and local phenomena which may be engendered by nervous impressions in this supposition. Of course, antecedently, it would be highly improbable that spasmodic action should continue persistently for so considerable a period, and should give rise to phenomena of a character so regular and uniform. Intermissions and irregularity would be much more likely to occur, and for this reason Dr. Bristowe, in an elaborate paper on

<sup>a</sup> Bristowe. Brit. and For. Med.-Chir. Rev., Vol. 20, p. 229. Peacock on some of the Causes and Effects of Valvular Disease of the Heart, 1865, p. 59.

<sup>b</sup> Dublin Quarterly Journal of Medical Science, Vol 14, p. 354.

<sup>c</sup> Walshe. Diseases of the Heart, 3rd ed., p. 96.



inorganic mitral murmurs, previously referred to, dismisses somewhat summarily the notion of spasmodic action having any influence in the causation of mitral regurgitation, and attribute the incompetency to the dilatation of the ventricle, and atrophy of the chordæ tendineæ and musculi papillares. Yet it may be reasonably doubted whether we are enabled altogether to exclude such a mode of causation. Instances have been observed both of continuous and of rhythmic spasm,<sup>a</sup> of a nature quite as extraordinary as would be involved in such a supposition. The constantly recurring irritation of the blood entering the cavity of the ventricle might possibly assist in bringing about a constantly recurring spasmodic action. Indeed an excellent observer<sup>b</sup> has suggested that even the inorganic murmurs which are so frequent at the aortic orifice may be referred to perverted innervation.

Besides, it is impossible to refer the case which follows, and several of the cases recorded by Dr. Hayden, in a paper to be afterwards referred to, to a dilated condition of the ventricle, unless we are prepared to admit that a condition of dilatation, so considerable as to give rise to regurgitation, is capable of being rapidly produced and rapidly removed, a view which is not consonant with pathological or clinical experience. In this case there was certainly no appreciable dilatation. It is, no doubt, difficult to pronounce definitely on the absolute capacity of a ventricle, but any considerable dilatation would be readily recognized. It is curious, that out of six cases which are adduced by Dr. Bristowe in support of the dilatation theory, two are cases in which the dilated condition of the heart was only inferred and not actually observed at the *post mortem* examination; and as regards the condition of the musculi papillares and the chordæ tendineæ, in three of the six the actual condition on which so much stress is laid was also not directly observed.

A point, however, of much greater practical importance is the

<sup>a</sup> The Nervous System, by Sir Charles Bell, 1830, Appendix, p. 41 and 42. Parry, quoted by Romberg Diseases of the Nervous System. Vol. i., p. 287.

<sup>b</sup> "It is certain that, even when spanemia and anemia exist, functional murmur is commonly confined to cases characterized by palpitation—a result of nervous irritability—and that profuse venesection, hemorrhage, and other causes of spanemia, are also productive of palpitation, and of exalted nervous excitability. Therefore, without denying that an anemic and spanemic condition of the blood must necessarily facilitate the production of vibration and murmur, it seems to me probable that these functional murmurs are more closely connected with perverted innervation and disordered contractility of the valves and large vessels than with a mere alteration in the condition of the blood."—Fuller. Diseases of the Heart and Great Vessels, p. 47.

occurrence in this case of marked pulmonary congestion and of anasarca. In a very able paper, read at the recent meeting of the British Medical Association in Dublin, Dr. Hayden dwells on the absence of pulmonary engorgement as an important element in the diagnosis of inorganic mitral murmurs. It is impossible to comprehend why a regurgitation from functional derangement of the valve should not be accompanied or followed by the same disturbance of the circulation as would be brought about by a similar amount of regurgitation owing to actual changes in the structure of the valve. Indeed, it would seem more probable that the obstacle to the return of blood from the lungs would be, *cæteris paribus*, greater in some of the former cases, as the incompetence of the valves would be occasionally produced rapidly, and even suddenly, while in a large proportion of cases of organic change the incompetence would be of slow and gradual growth. Nor is there any reason why inorganic regurgitation should not be of very considerable amount. The fact, no doubt, is that the amount of pulmonary congestion, and the date of its appearance, are regulated by the amount of the incompetency, by the state of the ventricle, and by the general condition of the patient. It is very probable that several of Dr. Hayden's cases would have exhibited signs of pulmonary and systemic congestion had the regurgitation not yielded to treatment.

The anasarca and congestion of the lung, which existed in my case, cannot be attributed, I believe, solely, or even mainly, to the condition of the valve. The feeble, ill-nourished, and anemic state of the patient was, no doubt, powerfully instrumental in the production of the dropsical condition. But that there was a difficulty imposed upon the heart was shown by its firm and well-developed character of tissue. Indeed, a condition of what may be called relative hypertrophy seemed to have been induced. The heart might have been reasonably expected to share in the prevailing atrophy and wasting of the body. It was, on the contrary, an organ such as might have belonged to a strong, healthy woman. This points towards a cause having existed which kept up an abnormal stimulation of its nutrition, and renders it probable that had life been much prolonged actual hypertrophy would have been produced.

CASE II. *Mitral Regurgitation of a Temporary Kind.*—A gentleman, aged thirty-three, married for about two months, of strictly

moral and temperate habits, and who had always enjoyed excellent health, was seen by me in consultation with Dr. Newett, of Moneyglass. He suffered from great exhaustion, and from a feeling of faintness when he sat up more than a few minutes at a time. He had injudiciously taken purgative medicine with the idea of his illness being the result of biliousness, and, in consequence, the bowels were rather relaxed. There was no evidence of active disease of any kind; the tongue was clean, pulse 80, and very soft, and there was some appetite. On examining the heart a soft bellows-murmur was heard at the left apex, transmitted towards the left axilla, but quite inaudible at the base of the heart, and only faintly audible at the right apex. He had never had any rheumatic affection, nor any symptom of cardiac disease, and he had been examined for life assurance a short time previously by an excellent and careful stethoscopist, who had not detected any abnormal condition of the heart. Under these circumstances, I inclined to the opinion that the murmur was of functional origin, an opinion which was verified by the progress of the case, as under tonic treatment and rest he completely regained his strength, and the murmur gradually subsided. I had an opportunity of examining his heart a few days ago, and found that its action and sounds were perfectly normal, and free from any trace of murmur.

The conclusions to which a consideration of the last two cases and observations lead are:—

Firstly, that mitral regurgitation may be produced without organic disease of any kind; and

Secondly, that it may in some instances give rise to the same physical signs and to the same general symptoms as regurgitation from organic causes.



# CASE OF ANEURISM

OF THE

## THORACIC AORTA.

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JAMES STERLING, aged thirty-eight, labourer, married, was admitted into the Belfast General Hospital, January 25th, 1868.

*Family History.*—The patient and one sister are the only surviving members of a family of seven, the others having died young. Father died of fever; mother of dysentery.

*History.*—He has always been temperate and healthy; has never had syphilis. He was engaged at easy work until lately, when he got employment in a ship-yard. Here he was often obliged to lift and carry heavy weights. He was engaged about seven weeks in this employment, when he began to notice a whistling in his breathing, and to observe that his breathing became difficult when he carried heavy burdens. The whistling at first was observed only during expiration, but afterwards with both inspiration and expiration. The sound became gradually louder, and was increased by exertion and by going into the cold air from a house. The first symptoms of noise and difficulty of respiration were noticed about the end of December.

*Present Symptoms.*—The respiration is distinctly but not loudly stridulous, and there is no dyspnea when the patient is perfectly quiet. On the slightest exertion, however, such as sitting up or turning in bed, the stridor becomes loud, and distressing dyspnea is felt, which is still further increased by walking, and the stridor becomes audible at a considerable distance from the patient. The dyspnea is not influenced by position. He has a troublesome cough, which has nothing peculiar in its sound, and a scanty glairy expectoration. Tongue clean, appetite good, bowels regular; he

sleeps pretty well; pulse 75, when quiet and in the recumbent position, but greatly accelerated by exertion. The patient is pale, and has an anxious expression, but is tolerably stout and well nourished, although he states that he has latterly lost flesh; voice slightly husky, but not impaired in strength.

*Physical Examination.*—A prominence is observed at the junction of the second rib with its costal cartilage, and the sternum is somewhat convex and bulging at a point corresponding to this. No thrill or pulsation is perceptible; percussion over the prominence elicits a dull sound, but only when the stroke is made on the side furthest from the sternum; every where else the sound is quite normal; on auscultation the stridor seems loudest at the sternal notch; no difference in the respiration can be noticed on examining the two sides. There is a slight prolongation of the first sound at the base of the heart, hardly amounting to murmur. With this exception there is no abnormal sound to be detected. I made a laryngoscopic examination, but the patient did not bear the mirror well, and the attempt was productive of so much dyspnea that it was not repeated; as far as it was seen the larynx seemed healthy.

He seemed much benefited by the application of a couple of leeches to the trachea every alternate night, and by a little paregoric. Complete abstinence from exertion was enjoined.

February 21st.—Some streaks of blood were observed for the first time in the sputum, and a little was noticed occasionally during the subsequent fortnight, the quantity never exceeding a few drops in the day. I ventured to make the diagnosis of aneurism, and in a clinical lecture delivered at this time on this and two other cases of aortic aneurism which happened to be under my care in hospital at the same time, I drew the attention of the students to the positive and negative results which the examination of the patient gave us.

1st. Prominence and slight dulness at a particular part of the chest

2nd. Stridor and dyspnea of recent origin, and greatly aggravated by exertion.

On the other hand we had total absence of auscultatory signs, of pain, of characteristic cough, of any marked alteration of voice, of dysphagia, of inequality of the pulses or of the pupils, and of any venous congestion. With regard to the prominence and dulness, I attached little weight to their presence, as there was no pulsation or thrill or bruit detected in that situation, and I based the diagnosis mainly on the symptoms of dyspnea and stridor, the larynx being

free from disease, and the probabilities being greatly against tumour, owing to the age and health of the patient. I ventured also to say that the aneurism must press upon the trachea itself in consequence of the respiratory sounds being equal in both sides. I suggested that possibly the hemoptysis might depend on a very minute perforation, as had been observed in some cases, and that an early and rapidly fatal issue was to be apprehended. The further progress of the case may be briefly recorded.

March 3rd.—The attacks of dyspnea, which were previously only aroused by exertion, had now begun to appear without any apparent cause, and were of a very severe character. They occurred usually in the evening, and distressed and alarmed him very much; but they did not occur oftener than once in the twenty-four hours, and a day sometimes passed altogether without any of them supervening. I spoke to him of the possibility of tracheotomy becoming necessary during some of these attacks; however, he naturally objected very strongly to the idea.

March 4th.—After a quiet night he seemed at visit to be tolerably easy. Before I left hospital, however, I was summoned by a nurse to see him, and found him in a deplorable condition, gasping for breath, making desperate efforts to get air into the chest, the lips livid, the skin covered with cold sweat, the pulse rapid and feeble, and the stridor accompanying the respiration of the loudest description. When he saw me he said that his heart was breaking. Several members of the staff who happened to be in hospital came to see him, and agreed that tracheotomy was urgently required to avert the imminent danger of suffocation. While we were speaking he suddenly exclaimed "Thank God! I am better," and for a few minutes seemed relieved, but the dyspnea returned with increased severity, and it was clear that he could not survive any prolongation of his terrible sufferings. He consented to the operation, which was performed by Dr. W. MacCormac, assisted by Dr. Murney, and in the presence of Dr. Smith and of myself. The breathing became at once easier, but there was still a good deal of dyspnea, which continued during the night. He was able, however, to lie down and was much relieved. He was placed in a small ward, and the air was kept saturated with the vapour of boiling water.

From this period he had no suffering whatever from dyspnea. There was some cough and (for a few days) expectoration of a bronchitic character, owing to irritation of the air passages. He had a little morphia at night and slept well. His appetite was fair, and



he was easy and comfortable, and expressed himself hopefully as to his recovery. He was able to get up and sit at the fire without any distress from the exertion, an effort which, during the previous month, would have brought on severe dyspnea.

On the morning of the 23rd I entered the ward accompanied by Dr. Henry Brown and some students. He expressed himself as being very well, and was anxious to be allowed to go to a larger ward, in which he had been previous to the operation, so as to have the society of the other patients. While speaking a few drops of blood came from the opening in the trachea, which he wiped away, remarking that this was the first blood that had appeared since the operation. In a moment a gush followed; he coughed up a large quantity, which came both through the mouth and through the opening; the breathing was accompanied with a loud gurgling sound, and after a few minutes of this frightful scene, which seemed horribly long, he was dead, the heart continuing to beat for some time after respiration had apparently altogether ceased.

*Post mortem.*—The body was plump, and a good deal of subcutaneous fat existed. The lungs were found to contain a large quantity of blood in the air cells and bronchi, and collapsed very imperfectly. An aneurism was found pressing upon the left side of the trachea, and springing from the posterior part of the transverse portion of the arch of the aorta, below and beyond the origin of the subclavian artery. The parts were removed and were dissected with great care. The aneurismal tumour, which was about the size of a large walnut, and which is figured in the accompanying plate, had produced a considerable amount of pressure upon the side of the trachea, and had caused a projection into it which diminished its calibre considerably. There was an opening into the trachea through which a No. 4 catheter could be passed. The recurrent nerve of the left side, as well as a branch from it to the deep cardiac plexus, was found to be compressed, diverted from its course, and closely adherent to the left side of the tumour. Another small nerve, from the sympathetic, going to the same plexus, was also found adherent to the aneurism, and is figured in the plate. On the right side of the tumour a large cardiac branch of the right vagus seemed to have suffered also, but to a less degree than the recurrent. It was thickened, adherent to the tumour, and was probably pressed upon by it. The interior of the aorta showed a considerable amount of atheroma, especially in the neighbourhood of the opening into the sac. The parts beneath the pro-

minence which had been observed during life were examined, and it was found that no cause existed within the thorax for the bulging. It had been probably brought about by the action of the scaleni being more forcible than usual, in consequence of the difficulty of breathing, or it was perhaps of congenital origin.

*Observations.*—The points of most interest in this case are:—

Firstly—The possibility of arriving at a correct diagnosis of aneurism from symptoms in the absence of any physical sign derived from the organs of circulation. The case resembles closely one related by Professor Gairdner, in his work on Clinical Medicine<sup>a</sup>—a work to which the profession is indebted for much valuable information on this interesting and difficult subject. In Dr. Gairdner's case the patient died from suffocation, notwithstanding the performance of tracheotomy, the aneurism remaining unruptured. This termination was caused by the refusal of the patient to submit to tracheotomy at an earlier period, and I have no doubt that a similar termination would have occurred in my case had the operation been much longer deferred.

Secondly—The interesting practical fact of the great relief which was afforded by tracheotomy. Not only were the urgent symptoms which threatened speedy dissolution at once mitigated, but the patient had the inexpressible comfort of being completely free from the distressing dyspnea which every exertion had previously caused. He passed the remaining days of his life in what might be relatively considered ease, the suffering from the wound in the trachea being quite inconsiderable. He was able to get up and sit at the fire for some hours daily without any suffering being caused by the necessary effort, and in all probability his life was somewhat prolonged, for the exertion which the paroxysms necessitated might have brought about an earlier rupture.

Thirdly—The almost complete integrity of the vocal functions while the respiratory functions were so seriously interfered with, and the recurrent laryngeal subjected to so much pressure. That laryngeal spasm of a marked kind was present is evident, and it is difficult to get a satisfactory physiological explanation of why the voice was not to any considerable extent impaired. The slight huskiness which was noticed was not greater than occurs in cases when cough has existed for some time.

Fourthly—The interference with the nerves going to the car-

<sup>a</sup> Case I. p. 455.

diac plexus. It is possible that this may be in some cases the cause of the symptoms resembling angina, and of the disturbance of the circulation, which have sometimes been observed in connexion with aneurism. This interesting physiological point is only capable, however, of being worked out when the influence on the movements of the heart possessed by the vagus and the sympathetic system is much more clearly known than at present.

Fifthly—The explanation of the dyspnea and stridor. It was probably mainly dependent on two causes: the direct narrowing of the trachea produced by the lateral pressure on it by the aneurismal tumour, and the spasm induced by the increased pressure on the left recurrent nerve, which increased pressure was brought about by acceleration of the circulation leading to augmented arterial tension.

The former was probably the cause of the stridor observed when the patient was quiet, which was accordingly tracheal; the latter by giving rise to laryngeal spasm was the cause of the aggravation of this symptom when exertion was made, and of the dyspnea which accompanied it.

CASE OF EMPYEMA,  
WITH  
INEQUALITY OF THE RADIAL PULSES,  
AND  
PARALYSIS OF THE DIAPHRAGM.

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THE following case is, I think, of sufficient interest, in a diagnostic point of view, to make it desirable that it should be recorded.

Neal Kennedy, aged thirty-five, unmarried, labourer, was admitted into the General Hospital July 30th, 1867.

*History.*—Several members of his family died of tubercular diseases. Seven years ago he had been a patient in this hospital, the only record of his case to be found being the name of the disease for which he was admitted—"Hydro-pneumothorax"—and the period during which he was an inmate—namely, fourteen days. From this illness he states that he completely recovered. Two years ago he passed through an attack of typhus fever, for which he was treated in the Union Hospital of this town. With these exceptions his health has been always good; habits regular and temperate. He is a well-built man, pale, slightly bald, with an intelligent countenance, and rather prominent eyes.

About six months ago he began to suffer from pain in the left side, which he describes as having been of a catching character. He continued to be able to work for some months after the commencement of the pain. His strength and appetite, however, gradually failed, and his breathing became oppressed. He placed himself under medical treatment, and was blistered and purged without any benefit.



At present he complains principally of weakness; he has some diarrhea; no pain in side; very little cough, and the dyspnea is not at all considerable. His appetite is tolerably good; decubitus on back or left side; he sleeps pretty well.

*Physical examination.*—The left side of the thorax is observed to be dilated, its intercostal depressions effaced anteriorly, and no respiratory movements visible. A soft, painless, inelastic tumour is observed external to the left nipple; its diameter at the base is about two inches, and it covers portions of the seventh, eighth, and ninth ribs; the skin covering the tumour is not discoloured, nor is there any pulsation in it.

The impulse of the heart is visible on the right side, below, and rather external to the nipple. On palpation no vocal fremitus is to be felt in the left side, except close to the spine posteriorly. The circumference of the left side, on the level of a line passing from the spinous process of the seventh dorsal vertebra over the nipple, is  $21\frac{1}{2}$  inches; that of the right 19 inches.

On percussion absolute dulness is found to extend over the entire left side, and for about an inch beyond right margin of sternum. No respiratory sounds are audible, except in the neighbourhood of the spine; no vocal resonance. Respiration puerile on right side. There is distinct bulging in the epigastric and hypochondriac regions, owing evidently to displacement downwards of the diaphragm and of some of the abdominal viscera. Some tenderness on pressure is complained of in the left hypochondrium, where the depressed and resistant diaphragm can be readily recognized by the finger.

Pulse 72; in the *right* wrist tolerably full and soft, in the *left* very small—a fact to which my attention was first drawn by one of the students who surrounded the bed. A similar difference, but not so marked, was observed in the carotids. No murmur with the action of the heart; sounds normal. Pupils equal.

After consultation it was determined that the thorax should be tapped, as there could be no doubt of the necessity for the operation. Before the period arranged for the operation, however, he began to bring up by coughing considerable quantities of pus, and I hoped that in this way the entire contents of the pleural sac might be evacuated. During two days and nights the matter continued to be expectorated; the entire quantity got rid of in this way amounting to fifty-six fluid ounces. The impulse of the heart was now visible at a point higher than before by about an intercostal

space, and the circumference of the left side had diminished by three-quarters of an inch, being now  $20\frac{3}{4}$  inches. The amount of the expectoration was, however, diminishing a good deal, and the constant efforts to bring it up had become very distressing to the patient. He was totally unable, from this cause, to lie down or get any sleep. The pulse rose to 116, the difference in the two sides being still considerable; but it was thought rather less marked than it had been previously, and an inflammatory flush had appeared in the left hypochondrium, where tenderness had been previously noticed on pressure, pointing to the probable danger of perforation of the diaphragm in that situation. Under these circumstances I thought it would be unwise to delay any longer the puncture of the thorax.

The operation was performed by my friend and colleague, Dr. William MacCormac, the opening being made through the tumour and in the eighth intercostal space. At the time of the operation, and during the two subsequent days, 173 fluid ounces of good pus, devoid of odour, flowed from the opening. The operation was followed by considerable relief of the general symptoms; the patient was able to lie down and get some sleep. The intercostal depressions became now manifest; the heart passed over to the left of the sternum; the left radial and carotid pulses acquired fulness, and by the end of the third day no difference could be any longer observed in them. Indeed, more than one of the various medical men who had kindly examined the patient with me at different times, before the paracentesis, and while the inequality existed, on being asked to compare the pulses in the two wrists, were inclined to consider that the left was now rather the fuller and stronger. The discharge gradually diminished to about two ounces daily; the appetite and strength improved rapidly.

Without entering into details of the progressive changes which ensued, I may now give an account of the physical examination of the chest a fortnight after the chest had been tapped. The girth of both sides had diminished—that of the right side being now  $18\frac{1}{4}$  inches, that of the left  $18\frac{5}{8}$  inches. Taking the level of a line passing from the spinous process of the eighth dorsal vertebra through a point an inch below the nipple, we find that above this line the left side is resonant on percussion—duller than the right—but still moderately resonant. Within the same space vocal resonance and fremitus are distinctly recognizable, and the sounds of respiration are audible, being somewhat weaker and more harsh



than those of the opposite side. There is no trace of râle of any kind, nor is there any frietion sound.

Below the line mentioned vocal rsonancee and fremitus are altogether absent; no respiratory sound whatever is audible. On percussion we find amphorie resonance in front when the patient lies on his back, and some dulness at the most dependent part posteriorly. The situation of the resonance and dulness changes with any change in the position of the patient, but neither reaches a higher level than that of the line above mentioned. Pus flows pretty freely from the wound when the patient leans well forward, and a probe introduced through the wound can be moved freely in a large cavity. It was now evident that the lung had expanded considerably, but not sufficiently to fill the entire side, and that it had become adherent to the thoracic parietes, leaving between its base and the superior surface of the diaphragm a loculus filled with air and matter. The heart's sounds were quite normal, and unaccompanied by any echo or splashing.

With the diminished circumferenece of the upper part of the thorax, the bulging at and below the base became more noticeable, and a curious phenomenon became observable—namely, a depression of the prominent portion of the epigastrium and hypochondria, during inspiration, and an elevation during expiration; both these movements being the opposite of those observed during health. This depression was more evident when a somewhat forcible inspiration was made, and was much more marked on the left side, but even on the right side it was distinctly observable both by inspection and palpation. The amount of discharge was now about one fluid ounce daily. There was scarcely any cough; respiration free; appetite good, and strength fair. The patient remained up the entire day, and walked a good deal about the ward in which he was. From this period until he left hospital there was little change in the symptoms. The bulging diminished gradually, but the abnormal condition of the respiratory movements continued, although no longer recognizable, except when the hand was placed on the surface of the epigastrium or hypochondria. He continued to improve steadily, with the exception of some inflammation of the lymphatics of the right leg, which yielded readily to rest, and the application of the flannel bandage recommended by Sir Dominic Corrigan. He was able to remain some hours daily out of doors, and left hospital at his own request at the end of September.

About the end of October I visited him, at his own request, at his mother's house, in a filthy little street in one of the oldest and most neglected parts of the town. I found that he had been for some time getting worse; he had not been able to get nutritive food, and he had ceased to take the cod-liver oil which had been prescribed for him. The discharge had increased and become very offensive in smell, and diarrhea had set in, with a good deal of irritability of stomach. There was scarcely any cough; no expectoration; and the condition of the chest was very little changed. I advised him to go to hospital again, which he wished to do. However, about a fortnight after I learned that he was dead.

I have not entered into any account of the treatment, as there was nothing worthy of remark in the measures employed. Tonics, a moderate amount of stimulants and cod-liver oil forming the staple of the treatment.

*Remarks.*—All observers agree as to the fact of the pulse remaining unaffected in cases of empyema. A case by Larrey, in which extreme feebleness of the pulse in the large arteries coincided with cardiac displacement, is quoted by Walshe,<sup>a</sup> who is not inclined to consider that there was any mutual dependence between the two circumstances. Murmurs with the sounds of the heart have been observed, probably dependent on torsion of the aorta, in cases of great cardiac displacement, and an instance<sup>b</sup> is given of empyema of the left side, in which an aortic bruit, the result no doubt of pressure, was audible from the last rib upwards along the left side of the spine for about five inches. I am not aware, however, of any case being on record in which a difference in the pulses was noticed. In a recent and excellent work<sup>c</sup> on diseases of the lungs, the equality of the radial pulses is referred to as a diagnostic mark which may be relied on in cases of doubt as excluding the idea of empyema. Had the empyema been a pulsating one, as in the well-known cases reported by Dr. M'Donnell,<sup>d</sup> the diagnosis might have become very embarrassing. It would be easy to suggest modes by which this phenomenon may be caused. My own opinion inclines towards seeking for the explanation in some narrowing of the arteries by torsion or otherwise, inasmuch as the absence of any evidence of venous

<sup>a</sup> Diseases of the Lungs, 3rd ed., 1860, p. 263.

<sup>b</sup> M'Donnell. Dublin Journal of Medical Science, Vol. xxvi., p. 437.

<sup>c</sup> Fuller. Diseases of the Lungs, 2nd ed., 1867, p. 184.

<sup>d</sup> Dublin Journal of Medical Science, Vol. xxv., p. 1.

congestion puts the idea of its having been caused by direct pressure of the fluid out of the question. Whatever be the explanation, however, the possibility of the existence of an inequality of the radial pulses in a case of empyema, the inequality disappearing after the evacuation of the fluid, is a fact of some clinical importance.

The alteration in shape and movements observed at the base of the thorax and at the upper part of the abdomen evidently depended on the condition of the diaphragm. The paralysed and probably degenerated condition of this muscle, caused by the long-continued pressure, and probably, also, by the effect of the inflamed state of the pleura, prevented the action which is normally exerted on the base of the thorax by the fibres which arise from the ensiform cartilage, and from the cartilages of the lower ribs—an action which is antagonistic to any forward movement of that region. Besides, the depression of the diaphragm, as well as of the upper abdominal viscera in contact with it, owing to the great mechanical pressure exerted by the superincumbent mass of fluid, would tend powerfully in the same direction. It was very remarkable, however, that the bulging should have continued after the removal of the great bulk of the fluid. This can only, I think, be accounted for by supposing that the diaphragm had contracted some adhesions with the parts with which it had been brought into contact during the continuance of the pressure. Duchenne,<sup>a</sup> criticising Dr. Stokes'<sup>b</sup> observations on the condition of the diaphragm in some cases of empyema, observes, with justice, that paralysis of this muscle must, of necessity, be followed by an increase of its natural convexity, and by its becoming more elevated in the cavity of the thorax, owing to the action of the abdominal muscles. Some cause must accordingly have been in operation to retain the muscle in its anomalous position.

The explanation of the reversal of the usual respiratory movements is also to be looked for in the passive condition of the diaphragm, allowing it to yield to the action of atmospheric pressure when a partial vacuum was formed in the chest by the action of the other respiratory muscles during inspiration, and the elevation during expiration to the pressure exerted by the lungs then acted on by the elasticity of the thoracic parietes.

<sup>a</sup> De l'Electrisation Localisée. 2nd ed., 1861, p. 727.

<sup>b</sup> Dublin Journal of Medical Science, Vol. viii., p. 197.

Duchenne<sup>a</sup> suggests that valuable indications may be drawn in cases of empyema from a deficiency of isochronism in the movements of the thoracic and abdominal walls during inspiration and expiration, and gives some cases of empyema observed by Racle and others, as well as by himself, in which the hands placed one on each hypochondrium were moved in contrary directions during respiration—that placed on the sound side being elevated during inspiration and depressed during expiration, while that placed on the side where copious effusion existed was moved in the contrary direction. When this phenomenon is observed, he thinks that the diagnosis of paralysis of one-half of the diaphragm may be made, and that a probability is established, as had, indeed, been suggested by Dr. Stokes, of the effusion being the result of an acute inflammatory process, and not a simple hydrothorax. In this case Duchenne's sign did not exist, the action of the diaphragm—although the empyema was single—being null on both sides. At the same time some weight must be attached to the great amount of malposition of the diaphragm, altering completely the direction of its muscular fibres.

<sup>a</sup> Loc. cit., p. 728, et seq.





